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R.H. WILEY (Ed.): "Five- and Six-Membered Compounds with Nitrogen and Oxygen", 1962, Interscience Publishers, New York, US

JOURNAL OF POLYMER SCIENCE, part a-1, vol. 6, 1968, pages 3381-3393, New York, US; Y. IWAKURA et al.: "Polyhydrazides. III. N-methylated polyhydrazides by ring-opening of poly-p-phenylene-1,3,4-oxadiazole"

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Description

This invention concerns a process for preparing N-t-alkyl-1,2-diacylhydrazines by reacting a 1,3,4-oxadiazole, preferably a 2,5-diaryl-1,3,4-oxadiazole, with a tertiary alkyl cation precursor in the presence of a strong acid catalyst such as sulfuric acid.

The N-t-alkyl-1,2-diacylhydrazines, particularly aromatic, heterocyclic or alkyl substituted N-t-alkyl-1,2-diacylhydrazines, are known to have insecticidal activity against Coleoptera and Lepidoptera. The process of the present invention provides an economic method of producing the desired N-t-alkyl-1,2-diacylhydrazines from inexpensive and readily available starting materials.

Hasegawa et al U.S. Patent No. 4,435,600 discloses a process for the preparation of tertiary butyl hydrazine by the direct reaction of t-butanol with a hydrazine salt of a hydrohalogenic acid in the presence of a hydrazine dihydrohalogenide or a hydrogen halide. They considered their reaction to be an improvement over the process of reacting a hydrazine salt of a hydrohalogenic acid with a tertiary butyl halide to obtain a tertiary butyl hydrazine hydrohalogenide and forming the tertiary butyl hydrazine from the tertiary butyl hydrazine hydrohalogenide as disclosed in Hojo et al U.S. Patent No. 4,310,696.

Iwakura et al, 6 J. Polymer SCI.A-1 3381-3393 (1968), entitled "Polyhydrazides. III. N-Methylated Polyhydrazides by Ring-Opening of Poly-p-phenylene-1,3,4-oxadiazole" discloses a ring-opening methylation reaction of 1,3,4-oxadiazole in fuming sulfuric acid or polyphosphoric acid. At pages 3382 and 3383, they discuss ring-opening reactions of 1,3,4-oxadiazole. In the first reaction 2,5-bis-p-nitrophenyl-1,3,4-oxadiazole was reacted with dimethyl sulfate in oleum. In the second example 1,3,4-oxadiazole was reacted with trimethyl phosphate in polyphosphoric acid.

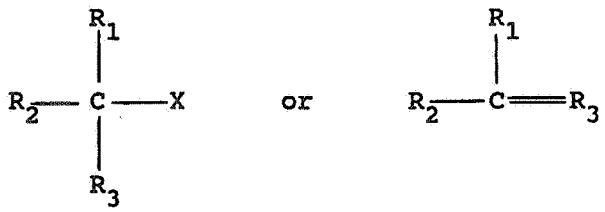
The Iwakura reaction and the present process proceed by two distinctly different mechanisms. The Iwakura reaction is a second order nucleophilic substitution (S_N2). The presently claimed reaction is a first order nucleophilic substitution (S_N1).

Further, under the conditions of the Iwakura reaction, the desired N-t-alkyl-1,2-diacylhydrazines are not stable. If the acid anhydride is in excess, as the oleum or polyphosphoric acid in Iwakura, the desired N-t-alkylhydrazine loses the t-alkyl group and cyclizes to the oxadiazole.

In accordance with the present invention, N-t-alkyl-1,2-diacylhydrazines may be prepared by reacting a 1,3,4-oxadiazole with a tertiary alkyl cation precursor in the presence of an acid catalyst. Preferably the 1,3,4-oxadiazole is a 2,5-disubstituted-1,3,4-oxadiazole and, more preferably, a 2,5-diaryl-1,3,4-oxadiazole.

The tertiary alkyl cation precursor is preferably selected from the group consisting of an alcohol, ester, ether, halogen or olefin. The more preferred tertiary alkyl cation precursor is an alcohol, acetate, benzoate, methyl ether, ethyl ether, carbonate, chloride, bromide or olefin. The most preferred precursors are t-butanol, t-butylacetate, t-butylbenzoate, t-butylmethyl ether, di-t-butyledicarbonate, t-butylethyl ether, t-butylchloride, t-butylbromide and isobutylene.

Generally, the preferred tertiary alkyl cation precursor has the formula:



where R_1, R_2 and R_3 are independently selected from the group consisting of (C_1-C_6) alkyl, (C_2-C_6) alkenyl or (C_2-C_6) alkynyl and X is OH, $OOCCH_3$, $OOCC_6H_5$, OCH_3, OCH_2CH_3,Cl or Br.

Generally the preferred acid catalyst must be strong enough to open the oxadiazole ring but not so strong as to dehydrate the hydrazine - such acid catalysts would be readily appreciated by the skilled reader. For example, the skilled reader would readily appreciate that acids which include the acid anhydride in excess cause the product hydrazine to dehydrate and revert to the oxadiazole and so would not fall within the scope of the present invention.

The preferred acid catalysts are sulfur containing acids and, more preferably, is selected from the group consisting of sulphuric acid, P - toluenesulphonic acid monohydrate, triflouromethanesulphonic acid and methanesulphonic acid. The most preferred acid catalyst is sulfuric acid. Although hydrogen chloride is

a stronger acid than p-toluenesulfonic acid, hydrochloric acid was found not to catalyze the reaction under the conditions tested whereas the p-toluenesulfonic acid was an effective catalyst.

The reaction process is preferably carried out in the presence of a solvent such as a low molecular weight acid (which is not an acid catalyst), low molecular weight ester, low molecular alcohol or low molecular ether. "Low molecular weight" is intended to include acids, esters, alcohols and ethers which are liquids at the reaction temperature. The preferred solvents are acetic acid, ethyl acetate, methylbenzoate and diethyl ether. The most preferred solvent is acetic acid. Depending upon reactants, catalyst and solvent, the process is preferably carried out between -20°C and 150°C. The process may be carried out between 0°C and 118° C. The more preferred temperature range is 15°C-60°C and the most preferred temperature range is 20°C-30°C.

The term "halo" should be understood as including chloro, fluoro, bromo and iodo. The term "alkyl" by itself or as a part of another substituent, unless otherwise stated, includes straight or branched chain groups such as methyl, ethyl, n-propyl, isopropyl, n-butyl, t-butyl, isobutyl, neopentyl and where indicated higher homologues and isomers such as n-octyl, isooctyl. The term "haloalkyl" by itself or as part of another substituent is an alkyl group of the stated number of carbon atoms having one or more halo atoms bonded thereto such as chloromethyl, 1- or 2-bromoethyl, trifluoromethyl. Analogously, "haloalkoxy" by itself or as part of another group is an alkoxy group of the stated number of carbon atoms having one or more halo atoms bonded thereto such as difluoromethoxy, trifloromethoxy, 2-fluoroethoxy, 2,2,2-trifluoroethoxy.

"Alkenyl" by itself or as part of another substituent comprises straight and branched chain groups of the stated number of carbon atoms. "Alkenyl" is intended to include alkadienyl, that is, a straight or branched chain alkenyl group comprising two carbon-to-carbon double bonds that can be conjugated such as 1,3-butadienyl, cumulated such as 1,2-propadienyl or isolated such as 1,4-pentadienyl.

The term "tertiary carbon" is meant to refer to a carbon having at least three carbon-to-carbon single bonds.

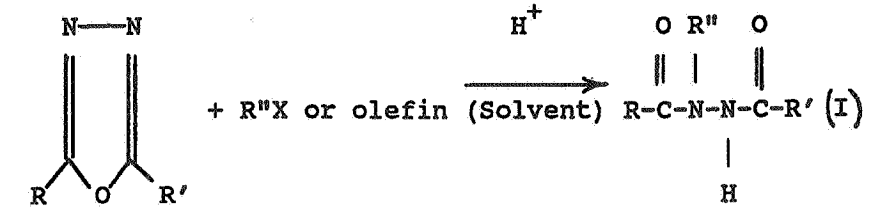
The term "aryl" should be understood to include those molecules which have a ring structure characteristic of benzene, naphthalene, phenanthrene and anthracene, that is either the six-carbon ring of benzene or the condensed six-carbon rings of other aromatic derivatives. Examples of aryl radicals include unsubstituted and substituted phenyl, benzoyl and naphthalene.

The term "cyclic aromatic radical" should be understood to mean unsaturated cyclic compounds including heterocyclic compounds. Examples of cyclic aromatic radicals include aryl, indolyl, thienyl, furyl, pyrrolyl, triazolyl and tetrazolyl.

Representative examples of six-membered heterocycles having one, two, three or four nitrogen atoms and two to five nuclear carbon atoms include 2-pyridyl, 3-pyridyl, 4-pyridyl, 3-pyridazinyl, 4-pyridazinyl, 5-pyridazinyl, 2-pyrimidinyl, 4-pyrimidinyl, 5-pyrimidinyl, 2-pyrazinyl, 3-pyrazinyl, 2-(1,3,5-triazinyl), 3-(1,2,4-triazinyl), 5-(1,2,4-triazinyl), 6-(1,2,4-triazinyl), 4-(1,2,3-triazinyl) and 5-(1,2,3-triazinyl).

Representative examples of five-membered heterocycles include 2-furyl; 3-furyl; 2-thienyl; 3-thienyl; 4-(1,2,3-triazolyl); 3-(1,2,4-triazolyl); 5-(1,2,4-triazolyl), 2-pyrrolyl; 2-oxazolyl.

The general reaction is shown in Equation (I).



When the 1,3,4 oxadiazole is unsubstituted, R and R^1 are both hydrogen. The 1,3,4 oxadiazole may be substituted at either the 2- position or the 5- position on the ring or the 1,3,4 oxadiazole may be substituted at both the 2- and 5- positions on the ring. Preferably R and/or R' are independently selected from the group consisting of hydrogen, (C_6-C_{10})aryl, 5- or 6-membered heterocycle, (C_1-C_{10})alkyl, (C_1-C_{10})alkoxy, (C_2-C_{10})alkenyl, (C_2-C10)alkenoxy and amino. The aryl and heterocycle may be unsubstituted or substituted preferably with one to three of the same or different (C_1-C_6)alkyl, halo(C_1-

C_6)alkyl, (C_1 – C_6)alkoxy, halo(C_1 – C_6)alkoxy, hydroxy, halo, nitro, cyano, carboxy, (C_1 – C_6)alkoxy – carbonyl, (C_1 – C_6)alkyl – carbonyl or amino. The amino may be unsubstituted or substituted preferably with one or two of the same or different (C_1 – C_6)alkyl, halo(C_2 – C_6)alkyl, cyano, carboxy, (C_1 – C_6)alkoxy – carbonyl, (C_1 – C_6)alkyl – carbonyl or amino. The alkyl, alkoxy, alkenyl and alkenoxy moieties may be unsubstituted or substituted preferably with one to three of the same or different (C_1 – C_6)alkoxy, halo(C_1 – C_6)alkoxy, hydroxy, halo, nitro, cyano, carboxy, (C_1 – C_6)alkoxy – carbonyl, (C_1 – C_6)alkyl – carbonyl or amino. Preferably, R and R′ are independently substituted or unsubstituted (C_1 – C_{10})aryl, 5 – or 6 membered heterocycle or (C_1 – C_{10})alkyl. In a preferred embodiement R and/or R^1 is unsubstituted phenyl or substituted phenyl. R″ is a tertiary carbon containing alkyl and, preferably, R″ is t – butyl. The olefin can, on protonation, yield a tertiary carbonium ion where the substituents are alkyl groups. The solvent may or may not be present.

In one particular embodiement of the present invention, the process comprises reacting a 2,5 – diaryl – 1,3,4 – oxadiazole with t – butanol, t – butyl acetate, t – butyl chloride or isobutylene in the presence of sulfuric acid and acetic acid at a temperature of between 15 ° C and 60 ° C. In this embodiement, the preferred aryl substituents of the 1,3,4 – oxadiazole are independently unsubstitued phenyl or substituted phenyl with one to three of the same or different halo, (C_1 – C_6)alkyl, halo(C_1 – C_6)alkyl, hydroxy or (C_1 – C_6)alkoxy.

The invention also encompasses the use of a N – t – alkyl – 1,2 – diacyl – hydrazine, which has been prepared by the process defined above, optionally in a composition additionally comprising agronomically acceptable diluent or carrier, for combating insects, particularly coleoptera and lepidoptera. The term "combating" as employed in the specification and claims of the present application is to be construed as including "insecticidal" and the protection of plants from insect damage.

The following examples will further illustrate the invention.

EXAMPLE NO. 1

Glacial acetic acid (6 ml) and 2.25 g of 2,5 – diphenyl – 1,3,4 – oxadiazole (10 mmol) were added to a 25 ml flask. Concentrated sulfuric acid (20 mmol) was added, then t – butanol (1.48 g, 20 mmol) was added dropwise over one – half hour. The reaction mixture was stirred at room temperature for 45 hours, then poured into dilute base and extracted with methylene chloride. The organic phase was washed with water and stripped, and the crude product was purified by flash chromatography to give 1.24 g (42% yield) of 1 – t – butyl – 1,2 – dibenzoylhydrazide, mp 173.5 – 175 ° C.

The examples set forth in Table 1 generally followed the procedure set forth in Example No. 1.

TABLE 1

Exam. No.	Oxadiazole	Solvent	Acid (eq)	R_1X (eq)	Temp. °C	Time	Conversion	Product
2.	2,5-diphenyl-1,3,4-oxadiazole	HOAc	H_2SO_4 (1)	t-BuOH (2)	40	13.5h	20%	N'-t-butyl-N,N'-dibenzoylhydrazine
3.	2,5-diphenyl-1,3,4-oxadiazole	HOAc	H_2SO_4 (1)	t-BuOH (excess)	70	24h	22%	N'-t-butyl-N,N'-dibenzoylhydrazine
4.	2,5-diphenyl-1,3,4-oxadiazole	HOAc	H_2SO_4 (1)	t-BuOH (1)	RT	6.5d	25%	N'-t-butyl-N,N'-dibenzoylhydrazine
5.	2,5-diphenyl-1,3,4-oxadiazole	HOAc	H_2SO_4 (1)	t-BuOH (2)	RT	16h	21%	N'-t-butyl-N,N'-dibenzoylhydrazine
6.	2,5-diphenyl-1,3,4-oxadiazole	HOAc	H_2SO_4 (2)	t-BuOH (1)	RT	16h	54%	N'-t-butyl-N,N'-dibenzoylhydrazine
7.	2,5-diphenyl-1,3,4-oxadiazole	HOAc	H_2SO_4 (1)	t-BuOAc (2)	reflux	1h	11%	N'-t-butyl-N,N'-dibenzoylhydrazine
8.	2,5-diphenyl-1,3,4-oxadiazole	HOAc	H_2SO_4 (2)	t-BuOH (4)	RT	21h	44%	N'-t-butyl-N,N'-dibenzoylhydrazine
9.	2,5-diphenyl-1,3,4-oxadiazole	HOAc	H_2SO_4 (3)	t-BuOH (1)	RT	45h	43%	N'-t-butyl-N,N'-dibenzoylhydrazine

Exam. No.	Oxadiazole	Solvent	Acid (eq)	R_1X (eq)	Temp. °C	Time	Conversion	Product
10.	2,5-diphenyl-1,3,4-oxadiazole	HOAc	H_2SO_4 (1)	t-BuOAc (1)	RT	22h	37%	N'-t-butyl-N,N'-dibenzoylhydrazine
11.	2,5-diphenyl-1,3,4-oxadiazole	HOAc	H_2SO_4 (2)	t-BuOAc (2)	RT	5.5h	79%	N'-t-butyl-N,N'-dibenzoylhydrazine
12.	2,5-diphenyl-1,3,4-oxadiazole	HOAc	H_2SO_4 (2)	t-BuCl (1)	RT	93h	2%	N'-t-butyl-N,N'-dibenzoylhydrazine
13.	2,5-diphenyl-1,3,4-oxadiazole	HOAc	H_2SO_4 (2)	isobutylene (excess)	RT	96h	75%	N'-t-butyl-N,N'-dibenzoylhydrazine
14.	2,5-diphenyl-1,3,4-oxadiazole	HOAc	TsOH (2)	t-BuOH (2)	RT	1wk	30%	N'-t-butyl-N,N'-dibenzoylhydrazine
15.	2,5-diphenyl-1,3,4-oxadiazole	None	CF_3SO_3H (0.4)	t-BuOH	reflux	4d	22%	N'-t-butyl-N,N'-dibenzoylhydrazine
16.	2,5-diphenyl-1,3,4-oxadiazole	None	H_2SO_4 (1)	t-BuOH	reflux	2h	11%	N'-t-butyl-N,N'-dibenzoylhydrazine
17.	2,5-diphenyl-1,3,4-oxadiazole	H_2O	H_2SO_4 (1)	t-BuOH (9:1 H_2O)	reflux	4.5h	22%	N'-t-butyl-N,N'-dibenzoylhydrazine

Exam. No.	Oxadiazole	Solvent	Acid (eq)	R_1X (eq)	Temp. °C	Time	Conversion	Product
18.	2,5-diphenyl-1,3,4-oxadiazole	diethyl ether	H_2SO_4 (2)	t-BuOH (2)	RT	48h	5%	N'-t-butyl-N,N'-dibenzoylhydrazine
19.	2,5-diphenyl-1,3,4-oxadiazole	EtOAc	H_2SO_4 (2)	t-BuOH (2)	RT	48h	28%	N'-t-butyl-N,N'-dibenzoylhydrazine
20.	2,5-diphenyl-1,3,4-oxadiazole	HOAc	H_2SO_4 (2)	2-Methyl-2-hexanol (1)	RT	20h	20%	N'-(1,1-dimethylpentyl)-N,N'-dibenzoylhydrazine
21.	2-(4-ethylphenyl)-5-(3,5-dimethyl-phenyl)-1,3,4-oxadiazole	HOAc	H_2SO_4 (2)	t-BuOH (2)	RT	46h	17% 14%	N'-t-butyl-N'-(3,5-dimethylbenzoyl)-N-(4-ethylbenzoyl)hydrazine; N-t-butyl-N'-(3,5-dimethyl-benzoyl)-N-(4-ethyl-benzoyl)-hydrazine
22.	2-methyl-5-phenyl-1,3,4-oxadiazole	HOAc	H_2SO_4 (2)	t-BuOH (2)	RT	72h	55% 14%	N'-t-butyl-N'-methyl-carbonyl-N-benzoyl-hydrazine; N-t-butyl-N'-methylcarbonyl-N-benzoylhydrazine
23.	2-furyl-5-phenyl-1,3,4-oxadiazole	HOAc	H_2SO_4 (2)	t-BuOH (2)	RT	24h	55% 4%	N'-t-butyl-N'-furoyl-N-benzoylhydrazine; N'-t-butyl-N-furoyl-N'-benzoylhydrazine

Exam. No.	Oxadiazole	Solvent	Acid (eq)	R_1X (eq)	Temp. °C	Time	Conversion	Product
24.	2-phenyl-1,3,4-oxadiazole	HOAc	H_2SO_4 (2)	t-BuOH (2)	RT	72h	42%	N'-t-butyl-N-benzoyl-N'-formylhydrazine
25.	2,5-diphenyl-1,3,4-oxadiazole	EtOAc	H_2SO_4 (2)	t-BuOAc (2)	0	7.25h	2%	N'-t-butyl-N,N'-dibenzoylhydrazine
26.	2,5-diphenyl-1,3,4-oxadiazole	HOAc	H_2SO_4 (2)	2,3-dimethyl-2-butene (2)	RT	1wk	8%	N'-(2,3-dimethyl-2-butyl)-N,N'-dibenzoylhydrazine
27.	2,5-diphenyl-1,3,4-oxadiazole	HOAc	H_2SO_4 (2)	di-t-butyl dicarbonate (2)	RT	5h	54%	N'-t-butyl-N,N'-dibenzoylhydrazine

eq means equivalents
d means days
h means hours
wk means week
R_1X is a tertiary carbon cation precursor
HOAc is glacial acetic acid
H_2SO_4 is sulfuric acid
t-BuOH is tertiary butanol
t-BuOAc is tertiary butyl acetate
t-BuCl is tertiary butyl chloride
RT is room temperature
TsOH is p-toluenesulfonic acid
CF_3SO_3H is trifluoromethane sulfonic acid
EtOAc is ethyl acetate

No alkylated dibenzoylhydrazine was observed under the conditions tested with isopropanol, benzyl alcohol, α,α-dimethylbenzyl alcohol, acetone cyanohydrin, 2,2-dimethoxypropane, benzylacetate or diisobutylene.

It should be understood that the instant specification and examples are set forth by way of illustration and not limitation, and that various modifications and changes may be made without departing from the spirit and scope of the present invention as defined by the appended claims.

Claims

1. A process for preparing a N-t-alkyl-1,2 diacylhydrazine comprising reacting a 1,3,4-oxadiazole with a tertiary alkyl cation precursor in the presence of an acid catalyst.

2. A process as claimed in claim 1 wherein the 1,3,4-oxadiazole is a 2,5-disubstituted-1,3,4-oxadiazole.

3. A process as claimed in claim 1 or Claim 2 wherein when the 1,3,4-oxadiazole is a 2- and/or 5-substituted 1,3,4- oxadiazole the substituent(s) is(are) independently selected from the group consisting of (C_6-C_{10})aryl, 5- or 6-membered heterocycle, (C_1-C_{10})alkyl, (C_1-C_{10})alkoxy, (C_2-C_{10})-alkenyl, (C_2-C_{10})alkenoxy, amino, substituted (C_6-C_{10})aryl, substituted 5- or 6- membered heterocycle, substituted (C_1-C_{10})alkyl, substituted (C_1-C_{10})alkoxy, substituted (C_2-C_{10})alkenyl, substituted (C_2-C_{10})alkenoxy and substituted amino; where when substituted the aryl and heterocycle are preferably substituted with one to three of the same or different (C_1-C_6)alkyl, halo(C_1-C_6)alkyl, (C_1-C_6)alkoxy, halo(C_1-C_6)alkoxy, hydroxy, halo, nitro, cyano, carboxy, (C_1-C_6)alkoxy-carbonyl, (C_1-C_6)alkyl-carbonyl or amino; where when substituted the amino is preferably substituted with one or two of the same or different (C_1-C_6)alkyl, halo(C_2-C_6)alkyl, cyano, carboxy, (C_1-C_6)alkoxy-carbonyl, (C_1-C_6)alkyl-carbonyl or amino; and where when substituted the alkyl, alkoxy, alkenyl and alkenoxy are preferably substituted with one to three of the same or different (C_1-C_6)alkoxy, halo(C_1-C_6)alkoxy, hydroxy, halo, nitro, cyano, carboxy, (C_1-C_6)alkoxy-carbonyl, (C_1-C_6)alkylcarbonyl or amino.

4. A process as claimed in any one of the preceding claims, wherein the tertiary alkyl cation precursor is selected from the group consisting of an alcohol, ester, ether, carbonate, halogen or olefin.

5. A process as claimed in any one of the preceding claims, wherein the acid catalyst is a sulfur containing acid.

6. A process of as claimed in Claim 5 wherein the acid catalyst is selected from the group consisting of sulfuric acid, p-toluenesulfonic acid monohydrate, trifluoromethanesulfonic acid and methanesulfonic acid.

7. A process as claimed in any on of the preceding claims, wherein the reactants are reacted in the presence of a solvent.

8. A process as claimed in claim 7, wherein the solvent is selected from the group consisting of low molecular weight esters, alcohols, ethers and acids other than said acid catalyst.

9. A process as claimed in any one of the preceding claims, wherein the reaction is carried out between -20°C and 150°C, preferably between 0°C and 118°C, more preferably between 15°C and 60°C, and most preferably between 20°C and 30°C.

10. Use of a N-t-alkyl-1,2- diacylhydrazine, which has been prepared by a process as claimed in any one of the preceding claims, optionally in a composition additionally comprising agronomically acceptable diluent or carrier, for combating insects, particularly coleoptera and lepidoptera.

Patentansprüche

1. Verfahren zur Herstellung eines N-t-alkyl-1,2-diacylhydrazins, bei dem ein 1,3,4-Oxadiazol mit einem tertiären Alkylkationen-Vorläufer in Gegenwart eines Säurekatalysators umgesetzt wird.

2. Verfahren nach Anspruch 1, worin das 1,3,4-Oxadiazol ein 2,5-disubstituiertes 1,3,4-Oxadiazol ist.

3. Verfahren nach Anspruch 1 oder 2, worin, wenn das 1,3,4-Oxadiazol ein 2- und/oder 5-substituiertes 1,3,4-Oxadiazol ist, der (die) Substituent(en) unabhängig davon aus der Gruppe von (C_6-C_{10})Aryl, einem 5- oder 6-gliedrigen Heterozyklus, (C_1-C_{10})Alkyl, (C_1-C_{10})Alkoxy, (C_2-C_{10})Alkenyl, (C_2-C_{10})Alkenoxy, Amino, einem substituierten (C_6-C_{10})Aryl, einem substituierten 5- oder 6-gliedrigen

Heterozyklus, einem substituierten (C_1-C_{10})Alkyl, einem substituierten (C_1-C_{10})Alkoxy, einem substituierten (C_2-C_{10})Alkenyl, einem substituierten (C_2-C_{10})Alkenoxy und einem substituierten Amino ausgewählt ist (sind), wobei, wenn das Aryl und der Heterozyklus substituiert sind, diese vorzugsweise mit ein bis drei der gleichen oder verschiedenen von (C_1-C_6)Alkyl, Halogen(C_1-C_6)alkyl, (C_1-C_6)-Alkoxy, Halogen(C_1-C_6)alkoxy, Hydroxy, Halogen, Nitro, Cyano, Carboxy, (C_1-C_6)Alkoxycarbonyl, (C_1-C_6)Alkylcarbonyl oder Amino substituiert sind, wobei, wenn das Amino substituiert ist, dieses vorzugsweise mit ein oder zwei der gleichen oder verschiedenen von (C_1-C_6)Alkyl, Halogen(C_2-C_6)-alkyl, Cyano, Carboxy, (C_1-C_6)Alkoxycarbonyl, (C_1-C_6)Alkylcarbonyl oder Amino substituiert ist, und wobei, wenn Alkyl, Alkoxy, Alkenyl und Alkenoxy substituiert sind, diese vorzugsweise mit ein bis drei der gleichen oder verschiedenen von (C_1-C_6)Alkoxy, Halogen(C_1-C_6)alkoxy, Hydroxy, Halogen, Nitro, Cyano, Carboxy, (C_1-C_6)Alkoxycarbonyl, (C_1-C_6)Alkylcarbonyl oder Amino substituiert sind.

4. Verfahren nach einem der vorhergehenden Ansprüche, worin der tertiäre Alkylkationen-Vorläufer aus der Gruppe von einem Alkohol, einem Ester, einem Äther, einem Carbonat, einem Halogen oder einem Olefin ausgewählt ist.

5. Verfahren nach einem der vorhergehenden Ansprüche, worin der Säurekatalysator eine Schwefel enthaltende Säure ist.

6. Verfahren nach Anspruch 5, worin der Säurekatalysator aus der Gruppe von Schwefelsäure, p-Toluolsulfonsäuremonohydrat, Trifluormethansulfonsäure und Methansulfonsäure ausgewählt ist.

7. Verfahren nach einem der vorhergehenden Ansprüche, worin die Reaktionsmittel in Gegenwart eines Lösungsmittels umgesetzt werden.

8. Verfahren nach Anspruch 7, worin das Lösungsmittel aus der Gruppe von niedrigmolekulargewichtigen Estern, Alkoholen, Äthern und Säuren anders als dem Säurekatalysator ausgewählt ist.

9. Verfahren nach einem der vorhergehenden Ansprüche, worin die Umsetzung Zwischen -20 °C und 150 °C, vorzugsweise zwischen 0 °C und 118 °C, besonders bevorzugt zwischen 15 °C und 60 °C und am meisten bevorzugt zwischen 20 °C und 30 °C durchgeführt wird.

10. Verwendung von N-t-alkyl-1,2-diacylhydrazin, hergestellt nach einem Verfahren nach einem der vorhergehenden Ansprüche, gegebenenfalls in einem Mittel, das zusätzlich ein landwirtschaftlich verträgliches Verdünnungsmittel oder einen Träger enthält, zur Bekämpfung von Insekten, insbesondere Coleoptera und Lepidoptera.

Revendications

1. Un procédé pour préparer une N-t-alcoyl-1,2-diacylhydrazine comprenant la réaction d'un 1,3,4-oxadiazole avec un précurseur de cation alcoyl tertiaire en présence d'un catalyseur acide.

2. Un procédé comme revendiqué dans la revendication 1, dans lequel le 1,3,4-oxadiazole est un 1,3,4-oxadiazole 2,5-disubstitué.

3. Un procédé comme revendiqué dans la revendication 1 ou la revendication 2, dans lequel le 1,3,4-oxadiazole est un 1,3,4-oxadiazole substitué en 2- et/ou en 5, le(s) substituant(s) étant, indépendamment, choisis dans le groupe constitué par aryl en C_6-C_{10}, hétérocycle à 5 ou 6 éléments, alcoyl en C_1-C_{10}, alcoxy en C_1-C_{10}, alcényl en C_2-C_{10},alcénoxy en C_2-C_{10}, amino, aryl en C_6-C_{10} substitué, hétérocycle à 5 ou 6 éléments substitué, alcoyl en C_1-C_{10} substitué, alcoxy en C_1-C_{10} substitué, alcényl en C_2-C_{10} substitué, alcénoxy en C_2-C_{10} substitué et amino substitué, dans lesquels, lorsqu'ils sont substitués, l'aryl et l'hétérocycle sont de préférence substitués par un à trois, les mêmes ou différents, alcoyl en C_1-C_6, haloalcoyl en C_1-C_6, alcoxy en C_1-C_6, haloalcoxy en C_1-C_6, hydroxy, halo, nitro, cyano, carboxy, alcoxy (en C_1-C_6)-carbonyl, alcoyl (en C_1-C_6)-carbonyl ou amino; dans lesquels, lorsqu'il est substitué, amino est de préférence substitué par un ou deux, les mêmes ou différents, alcoyl en C_1-C_6, haloalcoyl en C_2-C_6, cyano, carboxy, alcoxy (en C_1-C_6)-carbonyl, alcoyl (en C_1-C_6)-carbonyl ou amino; et dans lesquels, lorsqu'ils sont substitués, alcoyl, alcoxy, alcényl et alcénoxy sont de préférence substitués par un à trois, les mêmes ou

différents, alcoxy en C_1-C_6, haloalcoxy en C_1-C_6, hydroxy, halo, nitro, cyano, carboxy, alcoxy (en C_1-C_6)-carbonyl, alcoyl (en C_1-C_6)-carbonyl ou amino.

4. Un procédé comme revendiqué dans l'une quelconque des revendications précédentes, dans lequel le précurseur de cation alcoyl tertiaire est choisi dans le groupe constitué par un alcool, ester, éther, carbonate, halogène ou oléfine.

5. Un procédé comme revendiqué dans l'une quelconque des revendications précédentes, dans lequel le catalyseur acide est un acide contenant du soufre.

6. Un procédé comme revendiqué dans la revendication 5, dans lequel le catalyseur acide est choisi dans le groupe constitué par l'acide sulfurique, le monohydrate d'acide p-toluènesulfonique, l'acide trifluorométhanesulfonique et l'acide méthanesulfonique.

7. Un procédé comme revendiqué dans l'une quelconque des revendications précédentes, dans lequel les réactifs sont mis à réagir en présence d'un solvant.

8. Un procédé comme revendiqué dans la revendication 7, dans lequel le solvant est choisi dans le groupe constitué par les esters, alcools, éthers et acides (autres que ledit catalyseur acide), de faible poids moléculaire.

9. Un procédé comme revendiqué dans l'une quelconque des revendications précédentes, dans lequel la réaction est réalisée entre $-20°C$ et $150°C$, de préférence entre $0°C$ et $118°C$, plus préférablement entre $15°C$ et $60°C$ et le plus préférablement entre $20°C$ et $30°C$.

10. Utilisation d'une N-t-alcoyl-1,2-diacylhydrazine, qui a été préparée par un procédé tel que revendiqué dans l'une quelconque des revendications précédentes, éventuellement dans une composition contenant en outre un diluant ou un véhicule ou porteur agronomiquement acceptable, pour combattre les insectes, en particulier les coléoptères et les lépidoptères.